Atmospheric correction with polarization

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Atmospheric correction removes the effects of the atmosphere from the top of atmosphere (TOA) signal and reveals the surface. The adding-doubling, matrix operator, and similar methods detach the atmospheric effects (path radiance, diffuse reflectance, and transmittance) from the surface reflectance [1]. At the expense of a 1% error in the TOA signal, we neglect the radiation bouncing at the atmosphere–surface boundary. Thus, the TOA signal becomes directly proportional to the surface reflectance. The linear least squares method readily gives the coefficients for linear parameterization of the surface reflectance.

In our algorithm, we use three surface models. The Ross Thick – Li Sparse (RTLS) model [2] simulates the scalar reflection in the surface Mueller matrix. For other elements, we use a linear combination of the vegetation and bare soil models [3]. When the atmosphere is removed, we retrieve weights at the vegetation and soil using the PARASOL data, the RTLS, and aerosol parameters from MAIAC [4], and the aerosol optical thickness from AERONET. Our discrete ordinates radiative transfer code IPOL (Intensity & POLarization), thoroughly tested in [5], simulates diffuse atmospheric transmittance and the path radiance. IPOL decouples the atmosphere and surface using the matrix operator method.

To prove the concept, we will demonstrate the error analysis for thin and moderately thick atmospheres as well as the results of the inversion.

References

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